



USMC Industry Day #2

Software Reprogrammable Payload (SRP)

System Development Overview

5 May 2009

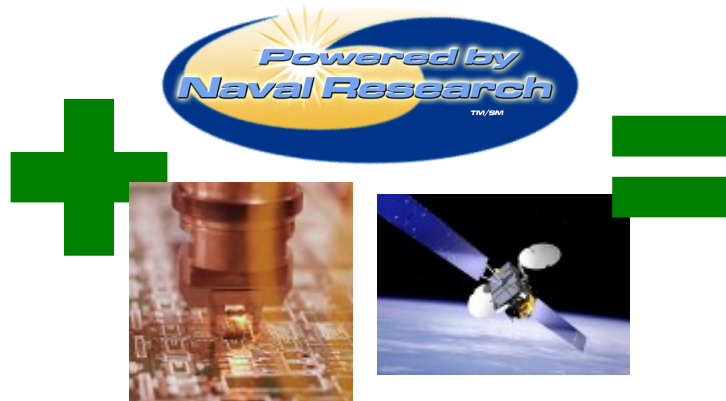
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Aviation Requirements (APW)
HQMC DC/Aviation

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How to Rapidly Respond to User Requirements

- Long development and procurement timelines in major acquisition programs
- The world changes a lot in a decade between when the requirements are written and programs are executed
- We think that the solution is a layered approach
 - Provide a framework to support current and future hardware and software
 - Build an acquisition strategy that supports continuous development to be rapidly pushed to users when needed and incrementally otherwise
- Government scientists and engineers working with DoD users to ensure developed standards and requirements will have applicability beyond the short term

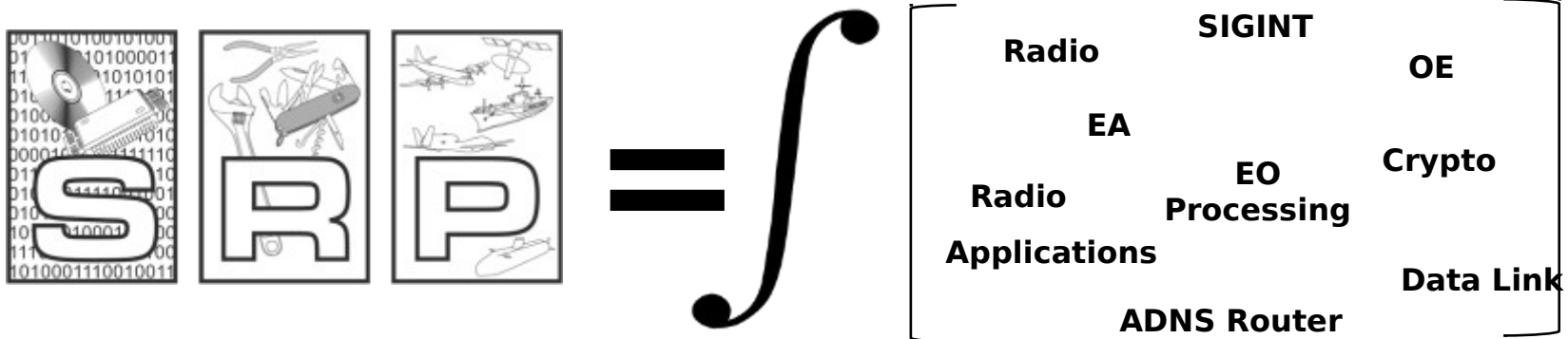
USMC Needs, Requirements and Ideas Government Labs and Industry



Mission Success

What is SRP ... Today?

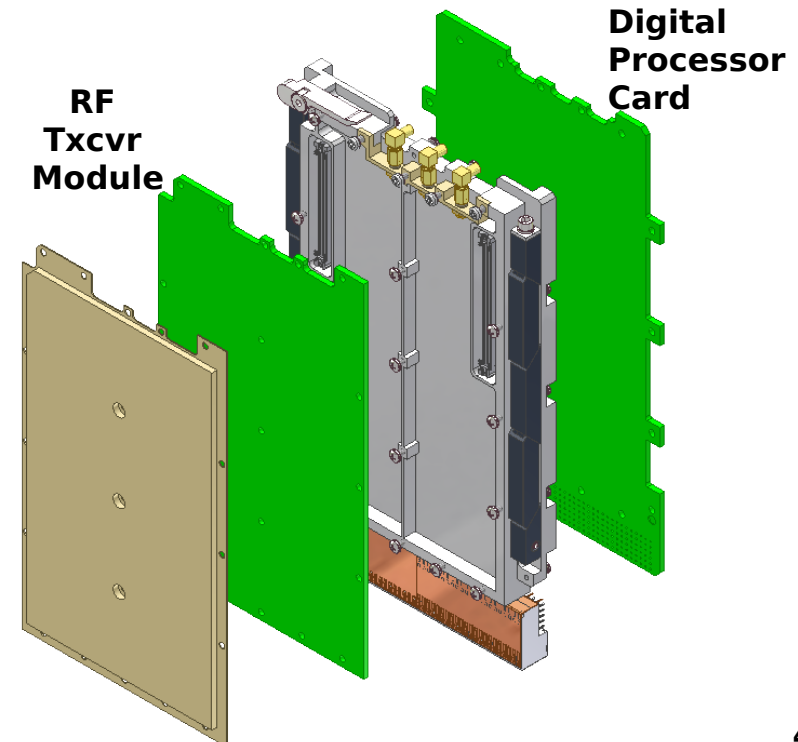
- **Software Reconfigurable Payload**
 - NOT *just* a radio
 - NOT *just* a receiver/SIGINT payload
 - NOT *just* a processor
 - NOT *just* a payload software infrastructure framework
 - NOT *just* a cryptographic module
 - NOT *just* a data or format converter
 - NOT *just* a waveform application



SRP is the result of Integrating A Set of Capabilities Which May Include all or a subset: Comms functions, SIGINT, Crypto, Data Routing, and others not yet conceived of yet

SRP Development Philosophy

- **Government-Industry Team**
 - Involved, committed project sponsors: USMC HQ Aviation, ONR, NAVAIR, OSD RRT0, Navy N6F
 - NRL As Technical Lead
 - A contractor team supplying engineering expertise; not a product
- **Government owned design and software**
 - Government purpose rights at the minimum, open source/GPL whenever appropriate
- **Portable software design**
 - As much industry standard code as possible
 - Minimize specialized software and hardware
- **Modular at all levels**
 - Hardware components
 - Software components
 - Firmware/processing components



Keys to Making SRP Technology Affordable & Effective (1 of 3)

- **Software Reconfigurable Payload technologies hold great promise for allowing diverse use of applications**
- **Keep “proprietary” technology out of SRP applications**
 - **Consider carefully the lifecycle costs of buying into proprietary waveforms and other items vice government development and ownership**
- **Leverage open source (or government source) as much as possible**
 - **Use development tools/toolchains that are “lowest common denominator”**
 - **Manage classification of code and modules carefully**
 - **Share/post source code to be used by others and/or enhanced by others**






Keys to Making SRP Technology Affordable, Effective (2 of 3)





- **Utilize collaboration methodologies**
 - “software forge.mil” being one example in government use - which itself is based on the “Sourceforge” open-source model
- **Government being intimately involved - controllers of the ICDs, and owners of the software products**
- **GFE Software Development Kits and/or Software Development Stations**
 - Level the playing field so SRP application development does not require a million dollar investment in infrastructure
 - Provide access to actual “deployable” hardware suites and test signal generators

SoftwareForge.mil - DoD's Collaborative Software Development Environment



SoftwareForge.mil is the place to host public projects for software re-use/collaborative development

-  **Introduction to Forge.mil Webinar Replay: Slides Available**
For those that couldn't make it to the Introduction to Forge.mil Webinar, the slides for the presentation are now available. You can also watch Slides to a replay of the presentation as well.
-  **SoftwareForge Community Discussions**
Do you have a great idea for how to improve SoftwareForge.mil (new project category, best practice around development, etc.)? If so, please contribute to the SoftwareForge project discussion area. This is your opportunity to help drive the development of this emerging community!
-  **Training for SoftwareForge Tools Available**
Do you have questions on how to use the SoftwareForge tool suite? Answers are available in the site-wide training project. Computer-based "On Demand" training is available, and coming soon - instructor-led training. Please check back often for updates!

IEEE Std 802.3af™-2003
(Amendment to IEEE Std 802.3™-2002, including IEEE Std 802.3ab™-2002)

802.3af™

IEEE Standard for Information technology—
Telecommunications and information exchange between systems—
Local and metropolitan area networks—
Specific requirements

Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications

Amendment: Data Terminal Equipment (DTE) Power via Media Dependent Interface (MDI)

IEEE Computer Society

Sponsored by the
LAN/MAN Standards Committee

 **IEEE**

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Keys to Making SRP Technology Affordable, Effective (3 of 3)



- **Development Team Diversity**
 - SRP related strengths
 - Vested interests and expertise
 - Avoid the “winner-take-all” approach, or at least encourage large primes to diversify their team with subject-matter expert experts
 - Enabled diversified business models for application development
- **Government commitment helps to encourage success**
 - Adequately fund the project
 - Commit to building up infrastructure/ICDs, and other sharing mechanisms
 - Support conferences and other ways to share information



**Large
Aerospace
Company**



University

Small Business



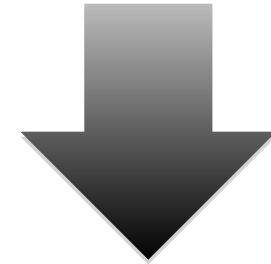
Provide Innovation Opportunities to Application Developers

- **SRP system provides multiple means for application developers to implement their area of their expertise**
- **Porting is straightforward**
 - **PowerPC compiler is open source (GNU)**
 - **FPGA development**
 - **MATLAB code**
 - **FPGA router tool**
 - **SRP “HAL” isolates FPGA interfaces from FPGA signal processing elements**
 - **Operating System**
 - **Linux for as long as possible for as many components as possible**
 - **Move to limited use of a proprietary OS if required due to security certification requirement**
 - **In either case, maintain POSIX compatibility**



Development Environment

- **Developers will be supplied government owned software development kit (SDK)**
- **SDK provide a software development environment at multiple levels of fidelity**
 - **Standalone [80%]**
 - Use a laptop or PC to develop software
 - Completely build and simulate on the laptop
 - **Developers kit / SRP Processor board [90%]**
 - **PowerPC Target**
 - **FPGA resources on SRP Processor board**
 - **SRP Transceiver card [100%]**
 - **PowerPC target**
 - **FPGA resources**
 - **RF resources**





Summary



- **Long acquisition timelines are a fact of life**
- **Building non-proprietary, government owned software and hardware designs allows a framework for enabling new disruptive acquisition models for new capability**
- **This requires the government to increase their involvement and go beyond being an acquisition agent but an agent of the program's success**
- **Tightly Coupled Government and Industry Team is Essential for Success**

USMC / NRL Software Reprogrammable Payload (SRP) Program Enables Rapid Response to Changing Needs While Ensuring Affordability - by Solving the Problem Once